Space Weather Technical Forecast

Issued on Friday, 22 October 2021 at 13:02 Local

This technical forecast provides a four day assessment of space weather events. The probabilities stated below are for reaching or exceeding the given levels. For more information about space weather impacts please see the Met Office Space Weather Scales https://www.metoffice.gov.uk/weather/learn-about/space-weather/uk-scales

Space Weather Forecast Headline: No significant activity expected.

Analysis of Space Weather Activity over past 24 hours

Solar Activity: Solar activity was Very Low, with only small B-class flares, these most likely from a new region that is currently emerging onto the southeast limb. There is one numbered region on the visible disc: AR2886 (Hsx/Alpha), in the southeast quadrant. This region appears to be stable with a magnetically simple configuration. A very faint Bxo/beta region has also emerged in the northeast quadrant, but this appears to be small and weak with no further development. No new Earth-directed CMEs were observed in available imagery in the last 24 hours, but some significant ones have been observed on the farside.

Solar Wind / Geomagnetic Activity: Solar wind speeds, as measured by DSCOVR at L1, have been at predominantly elevated levels, peaking at 526 km/s at 21/1638 UTC. The solar wind density was average. Total IMF, Bt, was weak (2-7nT) with a near-neutral north-south Bz component, which was mainly positive during the last 6 hours. The Phi angle was been mainly negative (towards the Sun). Resultant geomagnetic activity was Quiet (Kp 0-2).

Energetic Particles / Solar Radiation: The high energy proton flux (greater than 10 MeV) as measured by GOES-16 was at background levels, with no solar radiation storms observed. High energy electron flux (greater than 2 MeV) was predominantly at background levels. Associated 24-hour electron fluence was well below the Active (1e8 integrated pfu) threshold, with 1.24e6 integrated pfu recorded at 22/0000 UTC.

Four-Day Space Weather Forecast Summary

Solar Activity: Solar activity is expected to be at low or very low levels through the next few days, but with perhaps a slight increase in flare probabilities (5% M-class) as the new active region rotates further onto the southeast limb.

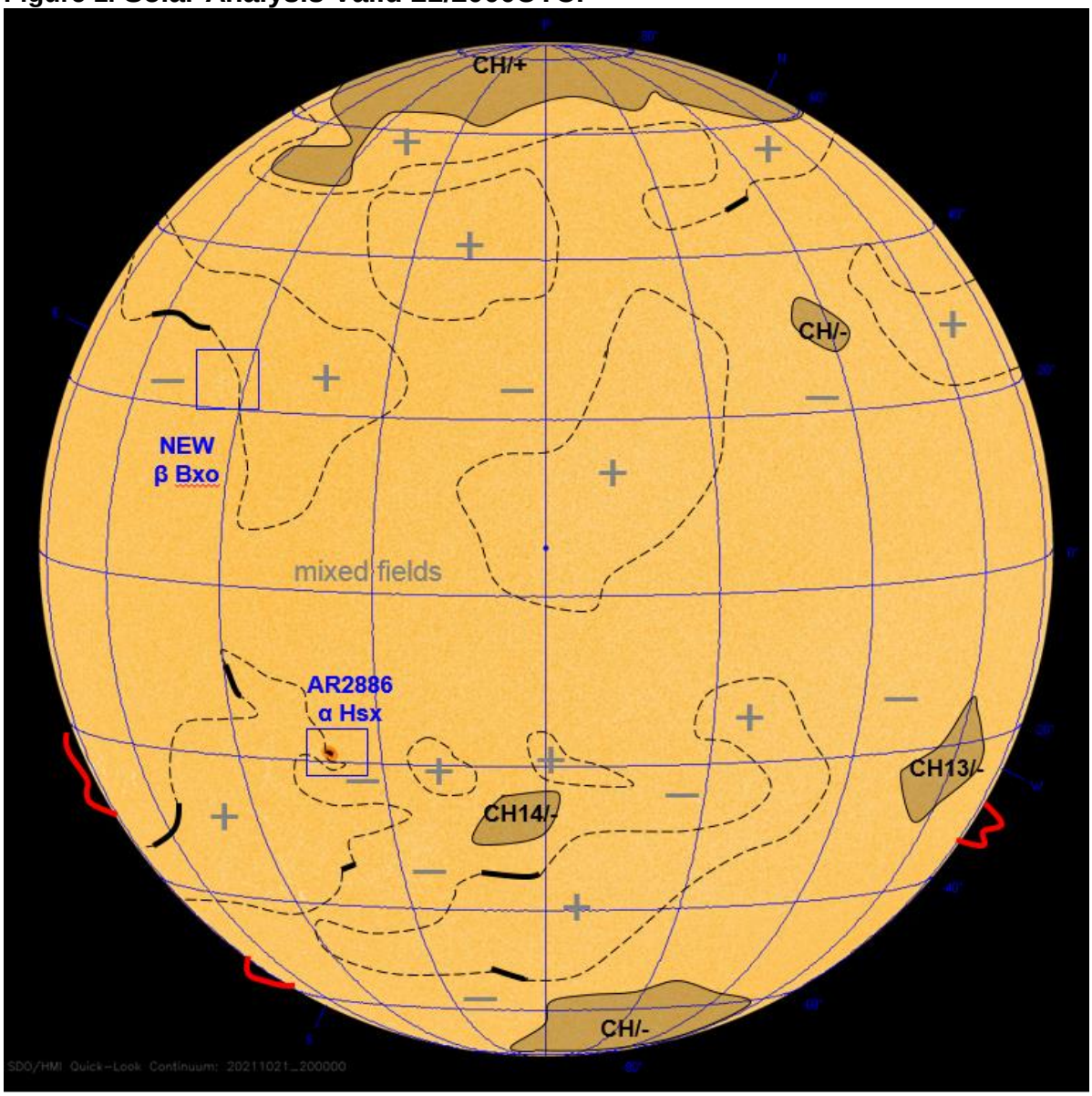
Solar Wind / Geomagnetic Activity: The solar wind is currently slightly elevated due to connection to CH13/-, but is waning and with no new features expected, the geomagnetic activity is expected to be mainly Quiet through the next 4 days (Kp 0-2) but with isolated Unsettled (Kp 3) intervals possible today.

Energetic Particles / Solar Radiation: The high energy (greater than 10 MeV) proton flux is expected to remain at background levels, with no solar radiation storms currently expected. The high energy electron flux (greater than 2MeV) is likely to remain at background levels, with the 24-hour fluence corresponding to low values throughout (remaining below the Active 1e8 integrated pfu threshold).

Issued by Met Office Space Weather Advisor, Tel: +44 (0) 330 135 4254 Email: moswoc@metoffice.gov.uk

© Crown Copyright 2021. All Rights Reserved.

Figure 1. Solar Analysis Valid 21/2000UTC.



Key: Filament ___ , Prominence ___ , Magnetic Field Line - - - , Polarity +/-, Coronal Holes: Grey shaded area CHxx +/-, Sunspot groups 25xx - Mt Wilson α-β-βγ-βγδ and Zurich-McIntosh Axx etc.

Issued by Met Office Space Weather Advisor, Tel: +44 (0) 330 135 4254 Email: moswoc@metoffice.gov.uk

© Crown Copyright 2021. All Rights Reserved.

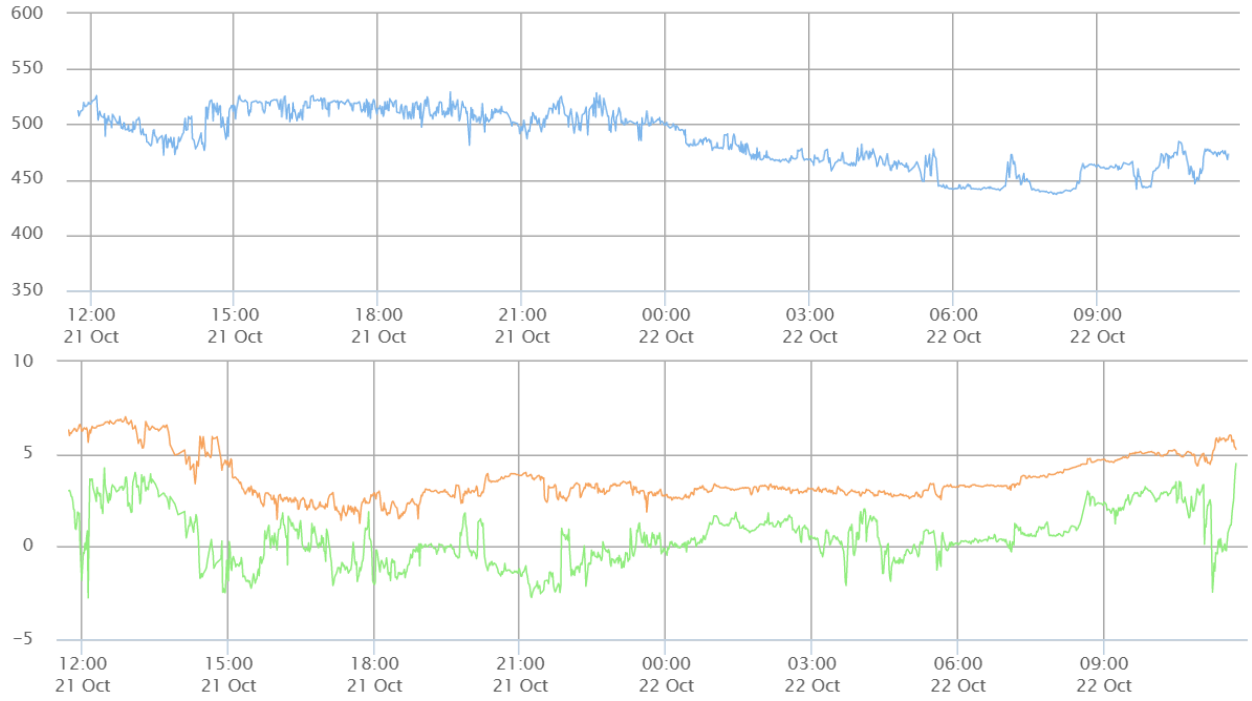
Geomagnetic Storms:

Solar winds are currently slightly elevated around 450 km/s due to coronal hole influences related to CH13/-. The hole was slightly more advanced on the solar disc (further west) than on the previous rotation, and as such solar winds have peaked earlier than the persistence forecast would have one believe, and is currently undergoing the decline. As no other features are currently forecast, the solar wind is expected to reach background levels and stay ambient for the following 3 days after today. Geomagnetic activity is expected to be mainly Quiet (Kp 0-2) but with isolated Unsettled (Kp 3) intervals possible for the rest of today (22nd).

Geo-Magnetic Storm Probability (Exceedance)	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Minor or Moderate	G1 to G2	No	1	1	1	1
Strong	G3	No	1	1	1	1
Severe	G4	No	1	1	1	1
Extreme	G5	No	1	1	1	1

Geomagnetic Activity - Earthbound Coronal Mass Ejections - NONE EXPECTED

Figure 2: DSCOVR Solar wind (top) showing decline, and Magnetogram (bottom) showing weak properties Bt and Bz



Issued by Met Office Space Weather Advisor, Tel: +44 (0) 330 135 4254 Email: moswoc@metoffice.gov.uk

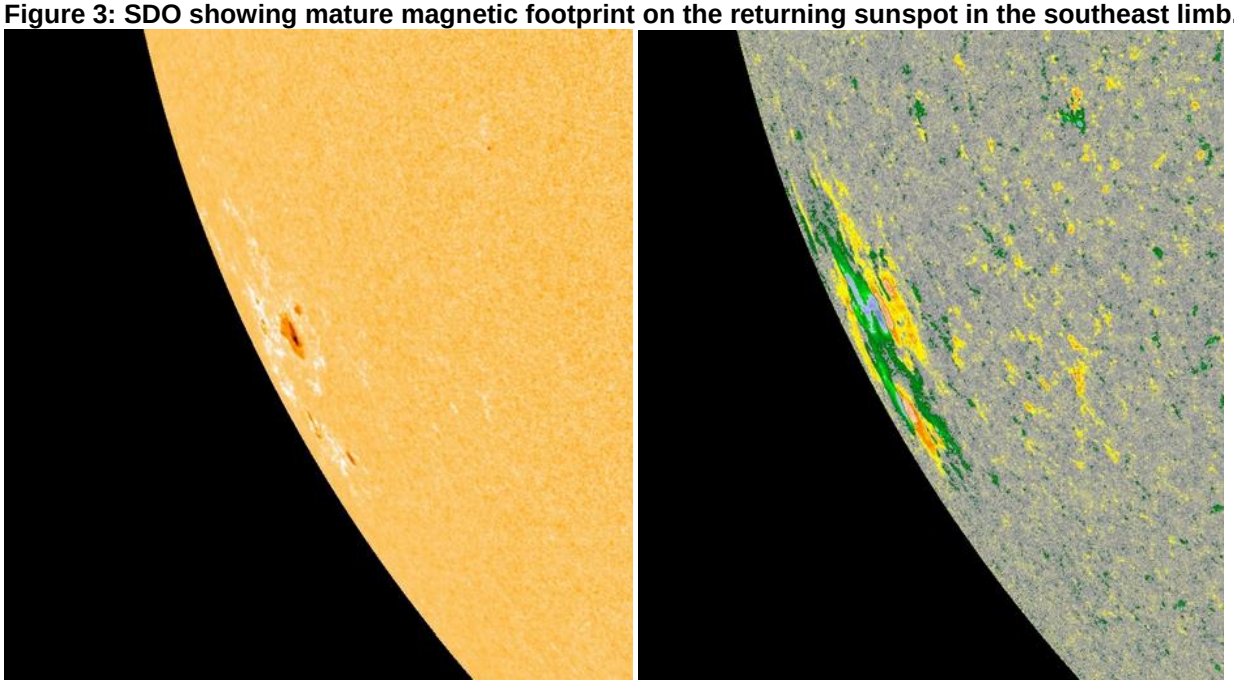
© Crown Copyright 2021. All Rights Reserved.

Radio Blackouts - X-Ray Flares:

Solar activity is expected to be at low or very low levels through the next few days.
There is one numbered active region on the visible disc at present, AR2886 (Hsx/Alpha), located in the southeast quadrant. This region remains in a stable configuration with no notable flares observed during the past 24 hours. A weak Bxo/beta region has also emerged in the northeast quadrant, but this appears to be be small and faint with no further development. However, a new, more complex region is currently emerging onto the southeast limb, likely responsible for the few small B-Class flares that have been observed over the past 24 hours. As such, the probability of flaring is likely to increase slightly over the next few days, reflected in the probabilities for M-Class flares.

X Ray Flares Probability	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	R1-R2 M Class	No	1	5	5	5
Very Active	R3 to R5 X Class	No	1	1	1	1

Figure 3: SDO showing mature magnetic footprint on the returning sunspot in the southeast limb.



Issued by Met Office Space Weather Advisor, Tel: +44 (0) 330 135 4254 Email: moswoc@metoffice.gov.uk

© Crown Copyright 2021. All Rights Reserved.

Solar Radiation Storms - (High Energy Protons):

With no significant sunspots in geoeffective positions on the Sun, solar radiation storms are currently not expected.

Radiation Storms Probability (Exceedance)	Level (cm^{-2} sr^{-1} s^{-1})	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	**≥ S1**	No	1	1	1	1
Very Active	**≥ S3 ***	No	1	1	1	1
* S3 ≥ 10 MeV ≥ 1000 pfu and / or ≥ 50 MeV ≥ 10 pfu. (pfu = $cm^{-2}sr^{-1}s^{-1}$)						

High Energy Electrons Event (≥ 2MeV):

The high energy (greater than 2 MeV) electron flux is currently at very low background levels. The influence of the current high speed stream, from CH13/-, has not been sufficient enough to raise electron flux counts within the radiation belts, probably due to the wrong phi-angle polarity for the time of year (negative is less efficient at disrupting our magnetosphere in Autumn). Flux levels rose on the previous rotation, but not above the High (1000 pfu) level, and perhaps there was some preconditioning going on which isn't evident now.

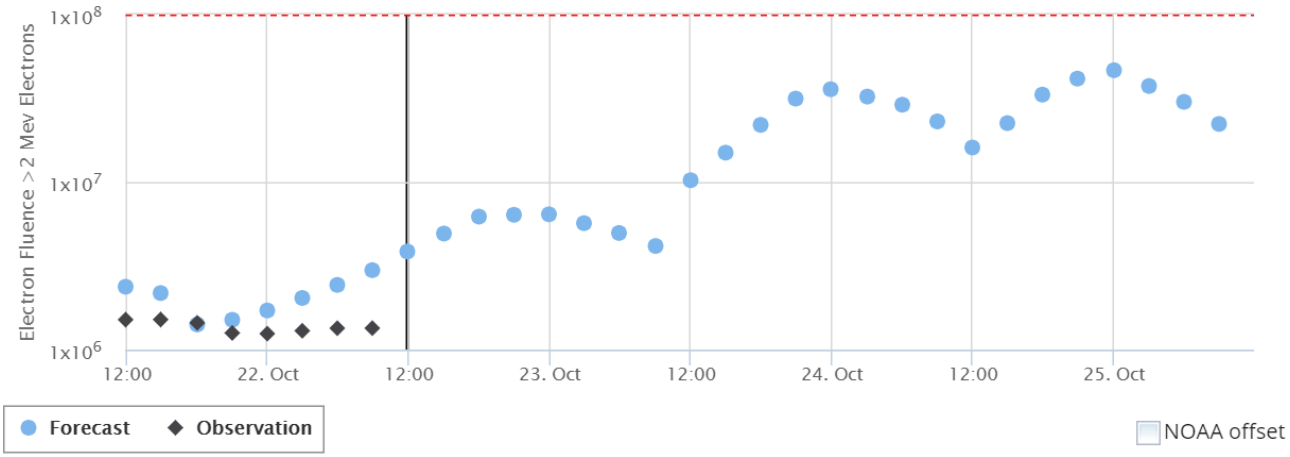
The corresponding electron fluence is currently well below the Active (1e8 integrated pfu) threshold on a steady trend. The REFM model currently indicating a rising trend, probably in response to persistence from the previous rotation, but overall keeping it well below the threshold through the next 4 days.

GEO Electron Environment Probability (Exceedance)	Level (cm^{-2} sr^{-1} day^{-1})	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	**≥ 2 MeV ≥ $1x10^8$**	No	1	1	5	5
Very Active	**≥ 2 MeV ≥ $1x10^9$**	No	1	1	1	1

Issued by Met Office Space Weather Advisor, Tel: +44 (0) 330 135 4254 Email: moswoc@metoffice.gov.uk

© Crown Copyright 2021. All Rights Reserved.

Figure 5: Latest Met Office REFM model, likely over-doing the day 2-3 period.



Issued by Met Office Space Weather Advisor, Tel: +44 (0) 330 135 4254 Email: moswoc@metoffice.gov.uk

© Crown Copyright 2021. All Rights Reserved.